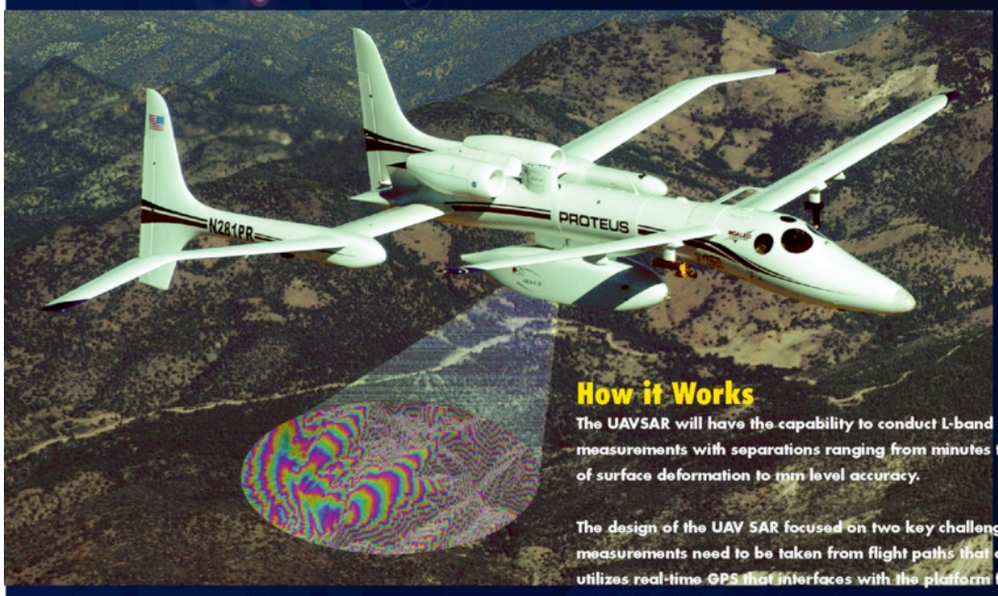
ESTO

Earth Science Technology Office

UAVSAR FOR REPEAT PASS DEFORMATION MEASUREMENTS

Space-based assets that carry out deformation measurements of the Earth's surface have become standard tools for solid Earth and glaciological sciences. The repeat orbit cycles of these assets – 24 to 44 days – limit their effectiveness in the study of quickly deforming features. An updated, modular Synthetic Aperture Radar (SAR) that can be flown on an uninhabited airborne vehicle (UAV) may soon become a valuable resource for these kinds of rapid measurements.



How it Works

The UAVSAR will have the capability to conduct L-band radar repeat pass interferometry measurements with separations ranging from minutes to years enabling the measurement of surface deformation to mm level accuracy.

The design of the UAV SAR focused on two key challenges. First, repeat pass measurements need to be taken from flight paths that are nearly identical. This instrument utilizes real-time GPS that interfaces with the platform flight management system (FMS) to confine the repeat flight path to within a 10 m tube. Second, the radar vector from the aircraft to the ground target area must be similar from pass to pass. This is accomplished with an actively scanned antenna designed to support electronic steering of the antenna beam with a minimum of 1° increments over a range to exceed ±15° in the flight direction.

Features and Benefits

- Enables a repeat pass in as little as 20 minutes
- Greatly reduced mass and volume to existing NASA airborne SAR technologies
- Modular design can be affixed to multiple airborne platforms including the ALTAIR UAV and the manned Proteus
- Flexible digital system that can trade data rate for performance and accept additional frequencies and parameters in the future
- Pre-programmed, autonomous operation without need for a radar operator

Future Applications

- Rapid, repeat-sampling for monitoring crustal deformations due to natural hazards such as magma movement and pre and post seismic activity along fault lines
- Studies of rapidly changing glaciers, ice, or vegetation

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